

ABSTRACT OF THE DISCLOSURE

A class of non data-aided cyclic based robust estimators for frequency offset estimation of multi-carrier systems is disclosed. The use of sufficient statistics provides a minimum variance unbiased (MVU) estimate of the frequency offset under complete knowledge of timing offset error. The Neyman-Fisher factorization theorem and Rao-Blackwell-Lehmann-Scheffe theorem are used to identify the sufficient statistic and appropriate mapping functions. It is shown that there is but one function of the sufficient statistics which results in the minimum variance estimate among the possible class of cyclic-based estimators. Also, a moment estimator of frequency offset is provided to obtain a consistent estimate of carrier offset under uncertain symbol timing error. The moment estimator does not rely on any probabilistic assumptions. Thus, its performance is insensitive to the distribution of the additive noise. A unified structure characterizing both the MVU and moment estimators, as well as a maximum likelihood estimator of a related, copending application is disclosed.